

In the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims

1-19. (cancelled)

20. (Currently amended) An metal interconnect structure on a semiconductor substrate, comprising:

~~a substantially straight walled~~ via hole in a insulator layer exposing a portion of an underlying lower level metal interconnect structure;

a recessed metal plug structure located in a bottom portion of said ~~substantially straight walled~~ via hole, with said recessed metal plug structure overlying and contacting the portion of said lower level metal interconnect structure exposed in said ~~substantially straight walled~~ via hole; and

~~said metal structure comprised with a metal segment located only on a first portion of a smooth top surface of said insulator layer, with an absence of said metal segment on a bare, second portion of said insulator layer; and~~

~~said metal structure comprised with a metal ring structure completely located in a top portion of said substantially straight walled via hole, contacting top surface of said recessed metal plug structure, with said metal ring structure continually decreasing in thickness from each side of, to the center of top portion of said substantially straight walled via hole;~~

a metal interconnect structure, comprising:

a metal ring component completely located in a top portion of said via hole,
contacting a top surface of said recessed metal plug structure, with said metal ring component
continually decreasing in thickness from each side to a center of said via hole; and

a metal interconnect component with a first portion thereof located on a first portion
of a smooth top surface of said insulator layer and a second portion thereof, on said via hole,
contacting a top surface of said metal ring component;

wherein said second portion of said metal interconnect component has a boundary, between
two sides of said via hole, defined by a photo-lithography and etching process.

21. (currently amended) The ~~metal~~interconnet structure of claim 20, wherein said lower level metal interconnect structure is comprised of a composite metal structure, featuring an aluminum, or an aluminum based layer, at a thickness between about 2000 to 20000 Angstroms, with an underlying titanium nitride layer, at a thickness between about 100 to 1500 Angstroms, and an overlying titanium nitride layer, at a thickness between about 100 to 1500 Angstroms.

22. (currently amended) The ~~metal~~interconnet structure of claim 20, wherein said ~~substantially straight walled~~ via hole is comprised with a diameter between about 0.10 to 1.0 μ m.

23. (currently amended) The ~~metal~~interconnet structure of claim 20, wherein said recessed metal plug structure, is comprised of tungsten, with the height of said recessed metal plug structure, located in said bottom portion of said ~~substantially straight walled~~ via hole, between about 3000 to 20000 Angstroms.

Claim 24 (currently amended): The ~~metal~~interconnect structure of claim 20, wherein said metal ring ~~structure~~component is comprised of aluminum, or aluminum-copper spacers, located on the sides of said top portion of said via hole.

In the Drawings

The attached sheets of drawings include changes to Fig. 6, Fig.7A, and Fig. 7B. These sheets replace the original sheets.

Exhibit A → Annotated drawing sheets (FIGS. 6, 7A, and 7B)

Exhibit B → Replacement drawings sheets (FIGS. 6, 7A, and 7B)